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Blue Ribbon Commission on America's Nuclear Energy Future

Personal Comments on Nuclear Waste Management and Recommendations the Future

Dear Commissioners:

I submit this letter based on my many years of involvement in the nuclear industry and my present role as a member of the US Nuclear Waste Technology Review Board (NWTRB). The assignment with the NWTRB has allowed me to understand the challenges of siting a US repository on a technical, managerial and political level. My experience as a nuclear industry utility executive provides additional insights on the waste management issue. The comments below are mine and are not those of the Nuclear Waste Technology Review Board.

The present failure of the US nuclear waste disposal program has political roots as do other efforts at siting interim waste storage facilities in the US. This is understandable and predictable. The future of any waste management strategy will also be subject to similar political pressures no matter how transparent or inclusive the process. Political needs, as was demonstrated in the recent presidential election, will trump science and process despite assurances to the contrary. With this as a fundamental assumption, the challenge is to develop a process that limits the potential for what has occurred in the past. Unless this is done, the likelihood of a successful solution to nuclear waste (disposal, storage or otherwise) will continue to be an elusive goal and billions of more dollars will be wasted on such attempts. I hope in your report to the President and Congress you make this clear and find a process that is less vulnerable to political manipulation. I offer a few suggestions that might be useful in this regard.

My key recommendations for the Blue Ribbon Commission are:

1. Change the management structure from a government driven organization to a private corporation. A government-private partnership is not recommended since it brings all of the political and bureaucratic weaknesses of the government into the project. This private corporation would be charged with site selection and well as design, licensing and operation. At time of closure, the facility would be turned over to the government for long term custodial care. Funding would come from the waste fund in a separate trust fund overseen by the industry and not part of the US budget to allow for continuity of funding to insure consistency of the program, staffing and implementation.

2. The private corporation would be charged with gaining community and state support as well as developing the transportation infrastructure. No advantage has been shown by any government role in project development, either in siting or implementation. The only successful interim storage facility has been the privately developed the Private Fuel Storage Company which was, unfortunately, politically targeted by the Bush

administration causing needless delays despite gaining an NRC license for construction and operation.

3. Establish regulatory requirements that are realistic and credible both technically and publicly. Million year standards are neither technically or publically credible. Most other nations employ safety criteria that are flexible with goals established that are not as prescriptive as those of the US Nuclear Regulatory Commission. The National Academy's Report "One Step at a Time: The Staged Development of Geologic Repositories for High-Level Radioactive Waste (2003) provides a good basis for proceeding forward with a fully retrievable repository design.

4. Incorporate probabilistic risk assessment criteria in the design process. Consider a flexible design approach with full retrievability in design. Separate surface facility design criteria from underground or post closure criteria which should be total system performance based. The Total System Performance Assessment process is a good methodology to apply to satisfy credible safety criteria. Treat extreme disruptive events as special events and not part of design process with a special accommodation of ultra high seismic events or volcanic eruptions as was done for human intrusion at Yucca Mountain. Global climate change should be considered but not in design since other more significant consequences of such events would dominate risks compared to those posed by the repository.

5. Design the facility to be a repository meeting the safety criteria established but initially license it as an underground storage facility with full retrievability as part of the design. This provides needed optionality should there be a need to "mine" the repository for fuels or for improved disposal technologies in the future. This also allows for appropriate monitoring and public confidence such that prior to closure, needed technical information can be obtained and, if not acceptable, the spent fuel can be removed. In its underground location, the spent fuel is protected from terrorist attacks which would be an added benefit.

6. In this model, the national labs would operate as scientific support organizations to conduct needed experiments and tests directed and funded by the private corporation. Industry no longer has the needed hot cells and laboratories to support the expected research needs.

7. Defense waste should be treated separately by the government. Should the government decide to locate its defense or research reactor waste in Waste Isolation Pilot Plant or another location, it would be their responsibility to implement such a plan independent of commercial spent nuclear fuel or nuclear waste.

8. There needs to be independent oversight of the private corporation that should be competent and not politically driven. The Nuclear Waste Technology Review Board is a good model but their role should be expanded to beyond simply technical assessments to include management effectiveness and public acceptance. Independent review boards of other nations have similar broad charters. This is necessary to allow for the Board to point out flaws in implementation and not just focus science and engineering. This requires naming people to the board with capabilities in social sciences and management.

9. Yucca Mountain is a viable site and it should continue to be considered as an option. Siting of a repository is not going to be an easy task given the history of DOE and the

waste management program. NRC should complete its review of its technical adequacy. Should it be found to be technically adequate, the final design, construction and operation should be given to the private corporation.

10. Should there be the need to find a new site, public acceptance should be considered as a primary criteria. There may be communities and states that might support a repository. In the US, without state support the likelihood of siting is greatly diminished, if not impossible. Should volunteer siting not work, an approach such as the Defense Base Closure and Realignment Commission (BRAC) may be another possible option.

11. Begin serious development of used fuel transportation infrastructure, routes and consistent requirements for storage and transportation. Also it is vital to eliminate needless state duplication of requirements in terms of inspecting and certifying national shipments of nuclear waste at each state border.

12. Remove the obstacles to constructing the licensed Private Fuel Storage Facility in Utah to demonstrate the used fuel can be safely transported and stored in a regional facility

13. Remove used fuel from decommissioned sites allowing them to be free released. Should the PFS site not be available in the near term, in the interim, ship the used fuel to existing government installations at national labs or secure military bases. The use of multiple regional sites would lesson the local concern about being targeted. The amount of the used fuel at decommissioned sites is estimated to be only 3,000 MT which could be easily accommodated at one or several small sites.

Listed below are my specific observations and suggestions based on the Yucca Mountain experience which might be useful for the Commission as they consider future directions.

Specific Observations:

- For too long the project was run as a science not engineering project. Engineering was needed to provide focus on important issues.

- Risk informed techniques such as TSPA are important for safety assessments but should be simplified to key processes so as not to lose importance of key variables to reduce uncertainty.

- Public risk was found to be negligible for over 10,000 years which is a credible time horizon for safety assessment.

- Risk was dominated by external events such as volcanism and seismic events. Global climate change is arguably more impactful than a repository containment failure. Consider, as other countries have done, putting extreme events as a special category for analysis to assess consequences but not in design criteria.

- Certain isotopes are contributors to risk most of which come from defense not commercial wastes due to the design of their waste packages.

- Risk based standards for surface facilities were inappropriate – DOE and NRC should have used more conventional building design criteria similar to those of nuclear power plants for similar facilities to avoid needless overdesign.

- Design the repository for full retrievability, even if unlikely.

- The focus on compliance as part of the license application as opposed to understanding how the repository would function is a short coming
    - Many key fuel degradation issues were not studied and assumed to be worst case – role of fuel and clad
    - Waste package degradation was studied but the environment was not well characterized. This was simple to fix but was never done.
    - The source term was simplified such that migration was not well understood resulting in unknown conservativisms.

What is recommended for the future should a new site be needed whether it is run by government or private enterprise:

- To avoid similar problems experienced at Yucca Mountain in terms of technical direction:

    - Establish reasonable technical standards. It is recommended that a 10,000 year timeline be adopted by law with specific risk informed safety goals based on a dose standard. Require consequence analyses for longer periods but only as a goal for design to assess potential consequences.
    - Establish clear site selection criteria that emphasize key determinants of a successful site
        - Avoid high seismic areas
        - Areas of recent volcanism
        - Pick sites that have a uniform geology
        - Limited water – key factor for normal operations
    - Recognize that no site will be "perfect" – need to be flexible in developing an integrated engineered and natural barrier solution. It is recognized that there will be "surprises" in the geological investigations which the engineered barrier system can address in design.
    - Focus on characterizing the actual environment where the waste packages will be stored and disposed for degradation mechanisms.
    - Hire contractors with a nuclear quality assurance and culture background – national labs do not have a nuclear industry safety culture nor do they generally understand NRC quality requirements.
    - Have peer review of DOE or project reports outside the agency
    - Run the project as an engineering project using risk modeling to assess key risk contributors to focus research and data acquisition to develop the safety case.
    - Focus on transportation issues now since spent fuel will likely need to be shipped to some interim storage location to limit government's financial liability
    - Design repository systems to accommodate standard storage cask systems now being deployed at nuclear plants to avoid massive fuel handling campaigns which would be required by repackaging containers.
    - Apply realistic criticality standards –full burnup credit is needed for both transportation and disposal.
    - Complete research on the adequacy of the technical basis for extended storage as the NWTRB report on the "Evaluation of the Technical Bases for Extended Dry Storage and Transporation of Used Nuclear Fuel" (2010) recommended.

- Have a robust science and technology program to support engineering design questions
- Keep lead lab concept but under the direction of the engineering management team.
- Early prototypes of key elements of the system should be part of the design program.
- Continue having independent technical oversight role such as the NWTRB of what DOE is doing on nuclear waste management. Expand the Board's mandate to address implementation, public acceptance, and management issues.
- Develop an integrated high and low level waste stream oversight process especially if reprocessing is proposed for future fuel cycles or as part of a waste management strategy.
- Engage more stakeholders in the process - utilities, vendors, local and state organizations including non-governmental agencies to be sure the technical data and analysis process is open. Do not worry about future licensing hearings since any flaws will eventually be identified.
- Assure sustained and predictable level of funding for project stability – multiyear budgets such as for aircraft carriers is recommended should the program continue to be government controlled.
- Consider separating defense waste from commercial high level waste.

I realize that there is a lot of material here, not all of which is in the Commission scope, but I hope some of it is helpful. If you have any questions, or would like to discuss any of these points, I would be willing to appear before the Commission again, if needed.

Sincerely yours,

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Member
Nuclear Waste Technology Review Board